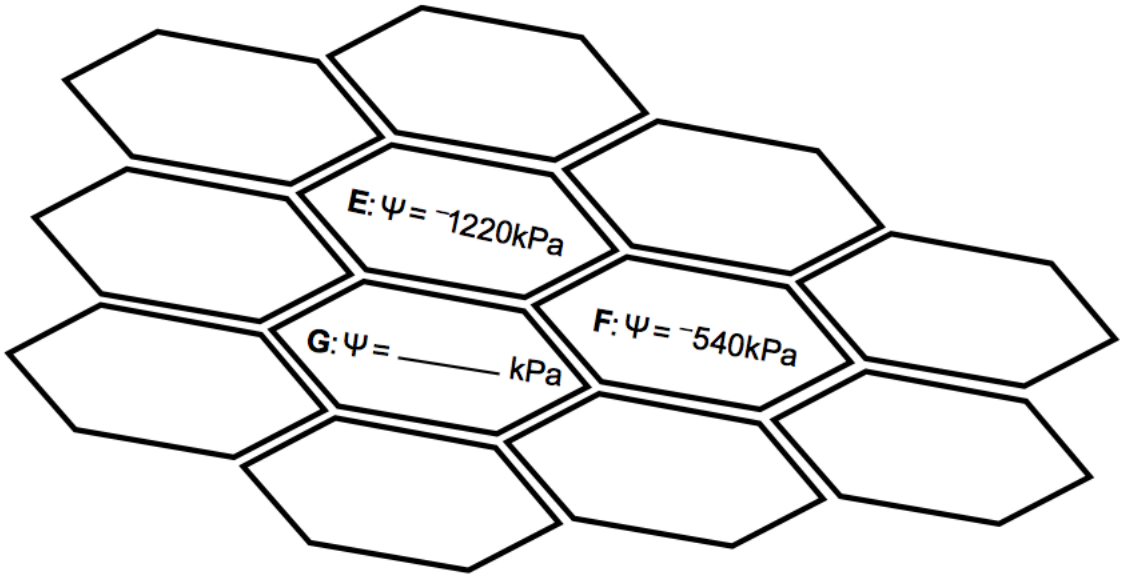
1.

The diagram below shows cells taken from plant tissue. Cells **E, F,** and **G** are adjacent cells and the water potential of cells **E** and **F** are given.



The water potential of a plant cell can be determined using the following formula:

$$\Psi cell = \Psi s + \Psi p$$

(a) (i) The pressure potential of cell **G** is 900kPa and the solute potential is −1600kPa. Calculate the water potential of cell **G** and write your answer in the space on the diagram above. [1]

(ii)

I Draw arrows on the diagram above to show the net movement of water molecules between these **three** cells. [1]

II Explain your answer in terms of water potential. [2]

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(b) (i) In an experiment, a student immersed plant tissue in salt solutions of different concentrations. The student then observed the plant tissue under the microscope. In one of the solutions the student concluded that the cells within the tissue were at incipient plasmolysis.
What observation had the student made that allowed her to make this conclusion? [1]

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(ii) The water potential of a cell at incipient plasmolysis was −430kPa.
Using this information state the value of the solute potential of the cell and explain how you arrived at your answer. [2]

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2.

Red blood cells are involved with the transport of oxygen around the body. Red blood cells lack internal organelles and their cytoplasm contains haemoglobin. Haemoglobin is a protein that consists of four polypeptide chains linked together.

(a) State the level of protein structure shown by haemoglobin. [1]

.....

(b) The diagram below shows one of the polypeptide chains from haemoglobin.

(i) On the diagram above, use an arrow to **clearly label** an alpha –helix. [1]

(ii) Complete the diagram above by writing in the empty box, the molecular group that would be present at the end of the polypeptide chain. [1]

(iii) Name **two** types of bonds that would be present to maintain the 3D shape of this polypeptide chain. [1]

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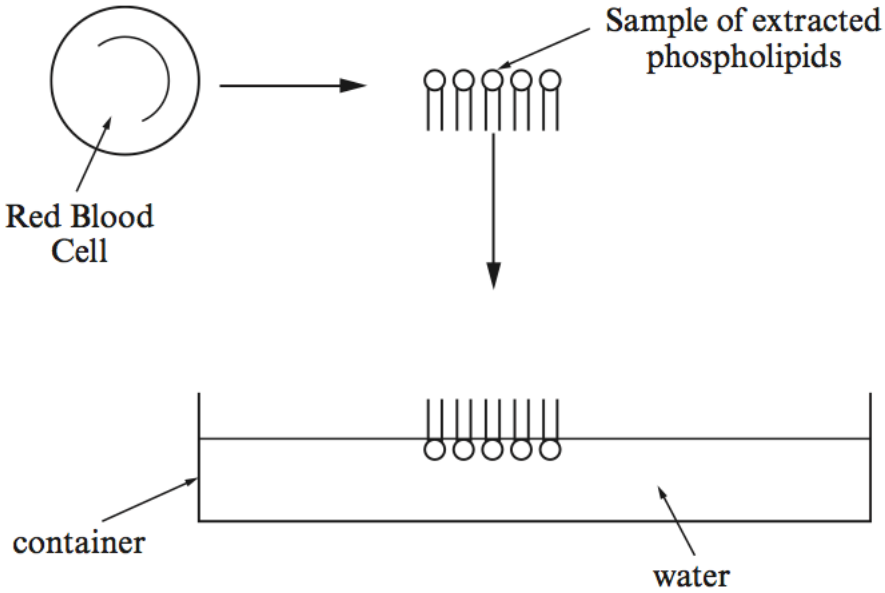
.....

(c) The plasma membrane contains proteins and phospholipids. Describe **two** ways in which the structure of phospholipids differ from triglycerides. [2]

(d) In 1925, two scientists, Gorter and Grendel investigated the arrangement of phospholipids in the plasma membrane. This involved the removal of the phospholipids from the surface membrane of all the red blood cells in $10cm^3$ of blood. The phospholipids were then placed on the surface of water and allowed to spread out to form a single layer, called a monofilm.



(i) Explain fully the arrangement of the phospholipid molecules as shown in the container on the diagram above. [2]

(ii) The area covered by all the phospholipids in the monofilm was found to be $12.2m^2$. The total surface area of the intact red blood cells had been previously measured. Using your knowledge of membrane structure, what would you expect the total surface area of the red blood cells to be? Explain your answer. [2]

(Total 10 marks)

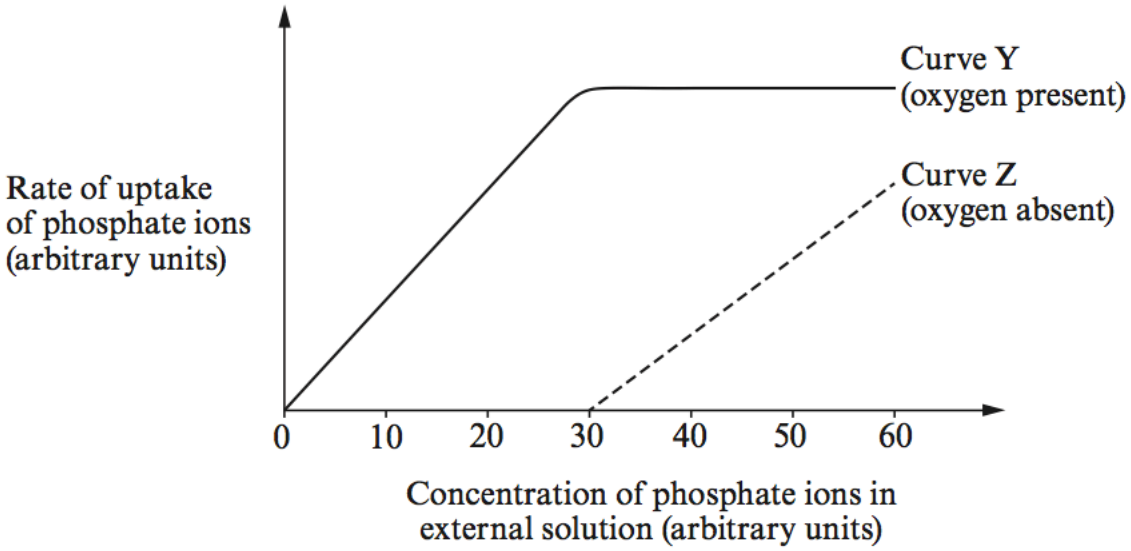
3.

(a) Oxygen (an uncharged molecule) and phosphate ions are both required by plants. They enter the cells through the plasma membrane. Use your knowledge of the structure of the plasma membrane to explain how each of these molecules enter the cell.

(i) Oxygen: [2]

(ii) Phosphate ions: [2]

(b) Phosphate ions are taken up by specialised cells in the roots called root hair cells. The graph below shows the effect of the external concentration of phosphate ions on the rate of uptake of phosphate ions.



(i) With reference to curve Y opposite, name the process that the cells use to uptake phosphate ions when the external concentration of phosphate ions is between 0 – 30 arbitrary units. Explain your answer. [3]

(ii) Explain the shape of curve Y between concentrations of 30 – 60 arbitrary units. [2]

(iii) Explain why the rate of uptake increases on curve Z between concentrations of 30 – 60 arbitrary units. [2]

State **one** reason (other than as a component of phospholipids) why the plant needs phosphate ions. [1]

(Total 12 marks)

4.

- Doxorubicin (DOX) and idarubicin (IDA) are antibiotics.
- They are widely used in human cancer treatment.
- DOX causes rapid changes in red blood cell membranes following injection.
- These changes are
  - decreased fluidity of the hydrophobic parts of the lipid bilayer
  - the membrane proteins change shape.
- IDA is considered to be less toxic to cancer patients than DOX.

(a) (i) Explain what is meant by the term 'lipid bilayer'. [1]

.....

.....

(ii) Name the 'hydrophobic parts' referred to in the information above. [1]

.....

(iii) State **two** functions of membrane proteins. [2]

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(b) Use the information above to suggest why the changes in red blood cell membranes caused by DOX make it more toxic than IDA. [2]

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(c) These drugs are used in cancer treatment. Explain briefly what is meant by the term cancer. [2]

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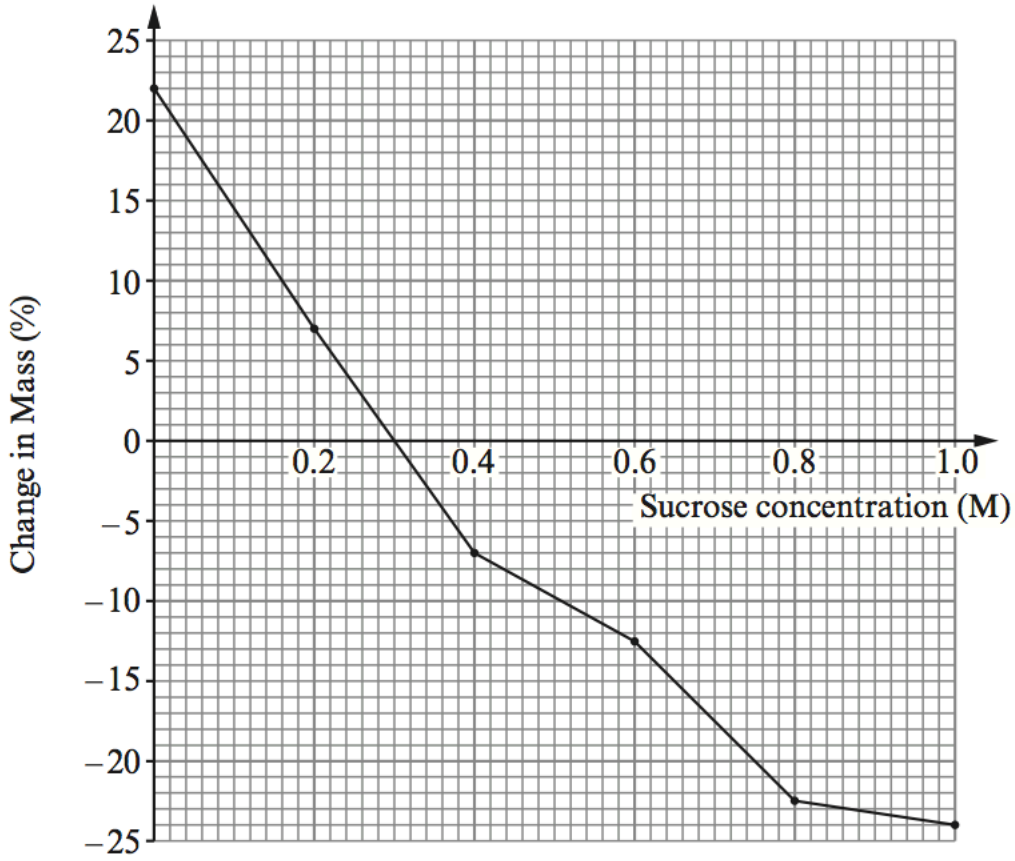
(Total 8 marks)

5.

An experiment was carried out to determine the water potential (Ψ_{cell}) of potato. A range of sucrose concentrations were prepared. Potato cylinders were weighed and then one was immersed into each of the solutions. After 2 hours they were blotted dry and reweighed. The percentage change in mass was calculated and the graph below plotted.



(a) (i) Describe the changes in mass in 0.0M (distilled water) **and** 1.0M sucrose solution. [1]

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(ii) What term is used to describe the appearance of the cells in 0.0M (distilled water)? [1]

.....

(iii) Explain the mass change in the 1.0M sucrose solution in terms of water potential. [3]

.....

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(iv) What term is given to the solution which causes no change in mass? [1]

.....

Table to convert molarity to solute potential (kPa).

Molarity of sucrose solution (M)	*Solute potential kPa*
0.05	–130
0.10	–260
0.15	–410
0.20	–540
0.25	–680
0.30	–860
0.35	–970
0.40	–1120
0.45	–1280
0.50	–1450
0.55	–1620
0.60	–1800

(v) Using the graph opposite and the table above determine the water potential (Ψ_{cell}) of potato tissue and **explain** how you arrived at your answer. [3]

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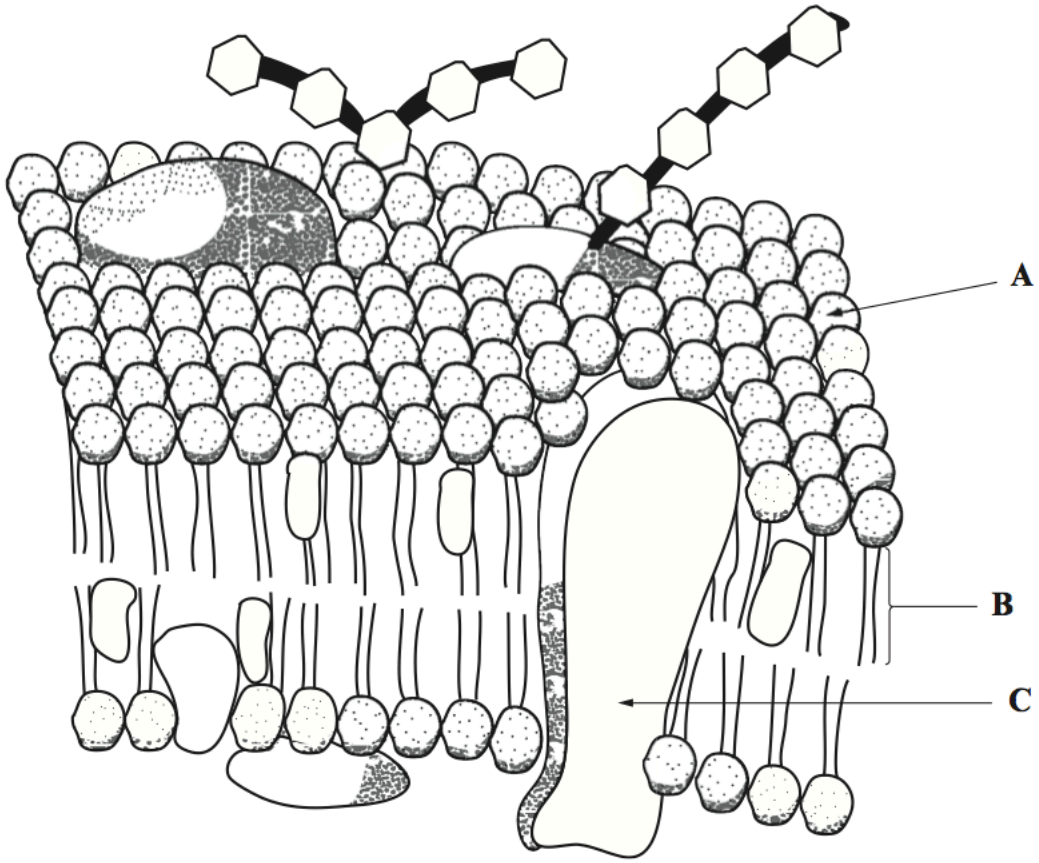
(b) Draw a labelled diagram of a cell as it would appear in the 1.0M solution. [2]

(Total 11 marks)

6.

The diagram shows the plasma membrane of an animal cell.



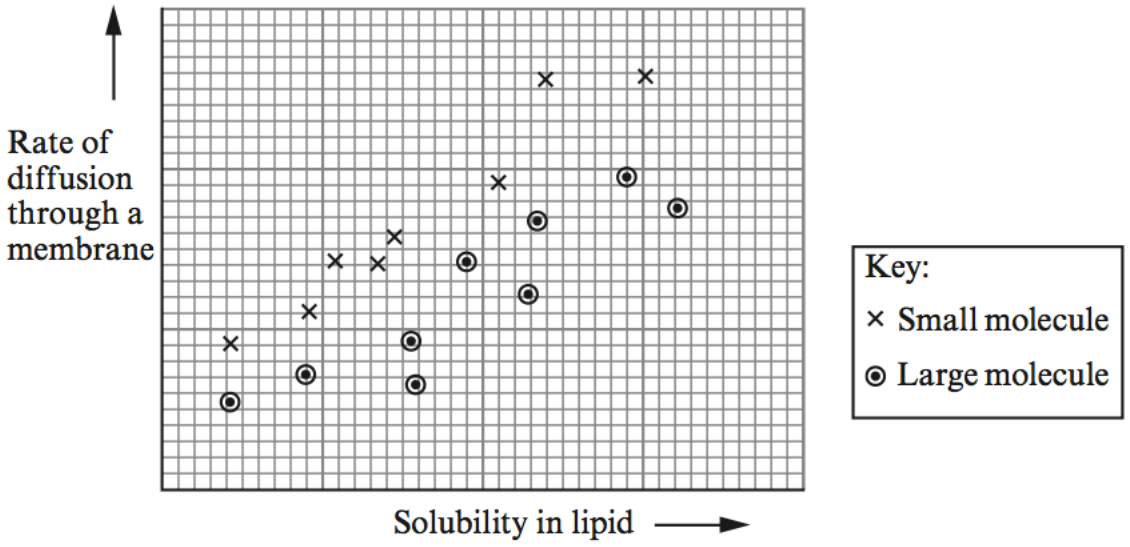
(a) State the names of the structures labelled **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) The graph shows the effect of molecule size and solubility in lipid on the rate of diffusion of substances through a cell surface membrane.



(i) State with an explanation how the solubility in lipid affects the rate of diffusion through a membrane. [2]

(ii) Describe how molecular size affects the rate of diffusion.
Suggest an explanation for your answer. [2]

) Name **two** factors which affect the rate of facilitated diffusion of a substance through a membrane. [2]

1. .....

2. .....

) Vitamins B_1 and K enter cells by crossing the plasma membrane. As vitamin B_1 is water soluble while vitamin K is fat soluble they take different routes across the membrane. Explain how the different routes taken by these vitamins into a cell, is determined by the structure of the plasma membrane. [4]

vitamin B_1 .....

vitamin K .....

(Total 13 marks)

7.

The diagram below shows two molecules which are sub-units of proteins.

(a) (i) Complete the diagram above to show how a reaction takes place to join the two molecules. [3]

(ii) Name the type of reaction involved. [1]

.....

(iii) Name the type of bond formed. [1]

.....

(b) (i) Why is the model of the structure of biological membranes described as 'fluid mosaic'? [2]

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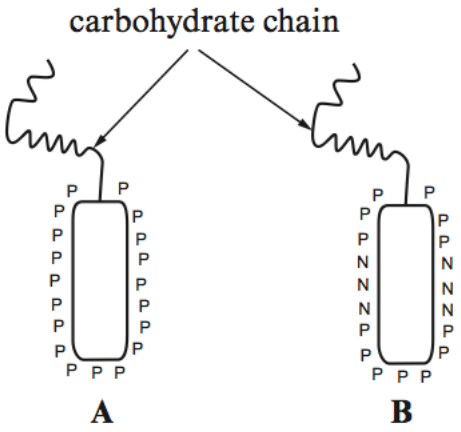
The diagrams below represent two glycoprotein molecules found in the plasma membranes of mammalian cells.



N = non-polar group
P = polar group

(ii) Which of the molecules **A** or **B** will form an **intrinsic** protein in the plasma membrane? [1]

Molecule .....

(iii) Draw a **labelled** diagram of the plasma membrane using the diagrams above to show the correct positioning of glycoproteins **A** and **B**. [2]

(iv) Give **one** function of the carbohydrate chains on the glycoproteins. [1]

.....

(c) Some diseases are caused by abnormal proteins called prions. Some prions have a higher proportion of β pleated sheet in place of the normal α helix structure.

(i) What level of protein structure is described by the terms α helix and β pleated sheet? [1]

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(ii) Which organelles are involved in synthesising proteins? [1]

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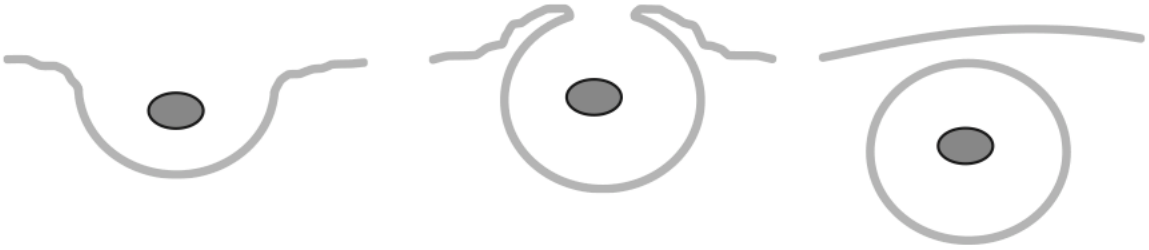
(d) The following diagram shows one way that prions may pass into cells.



1. Plasma membrane folds inwards.

2. Plasma membrane continues to fold engulfing the material.

3. Plasma membrane fuses to enclose the material.

(i) Name the process shown in the diagram above. [1]

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(ii) Name **two** *other* ways in which substances might pass into the cell. [2]

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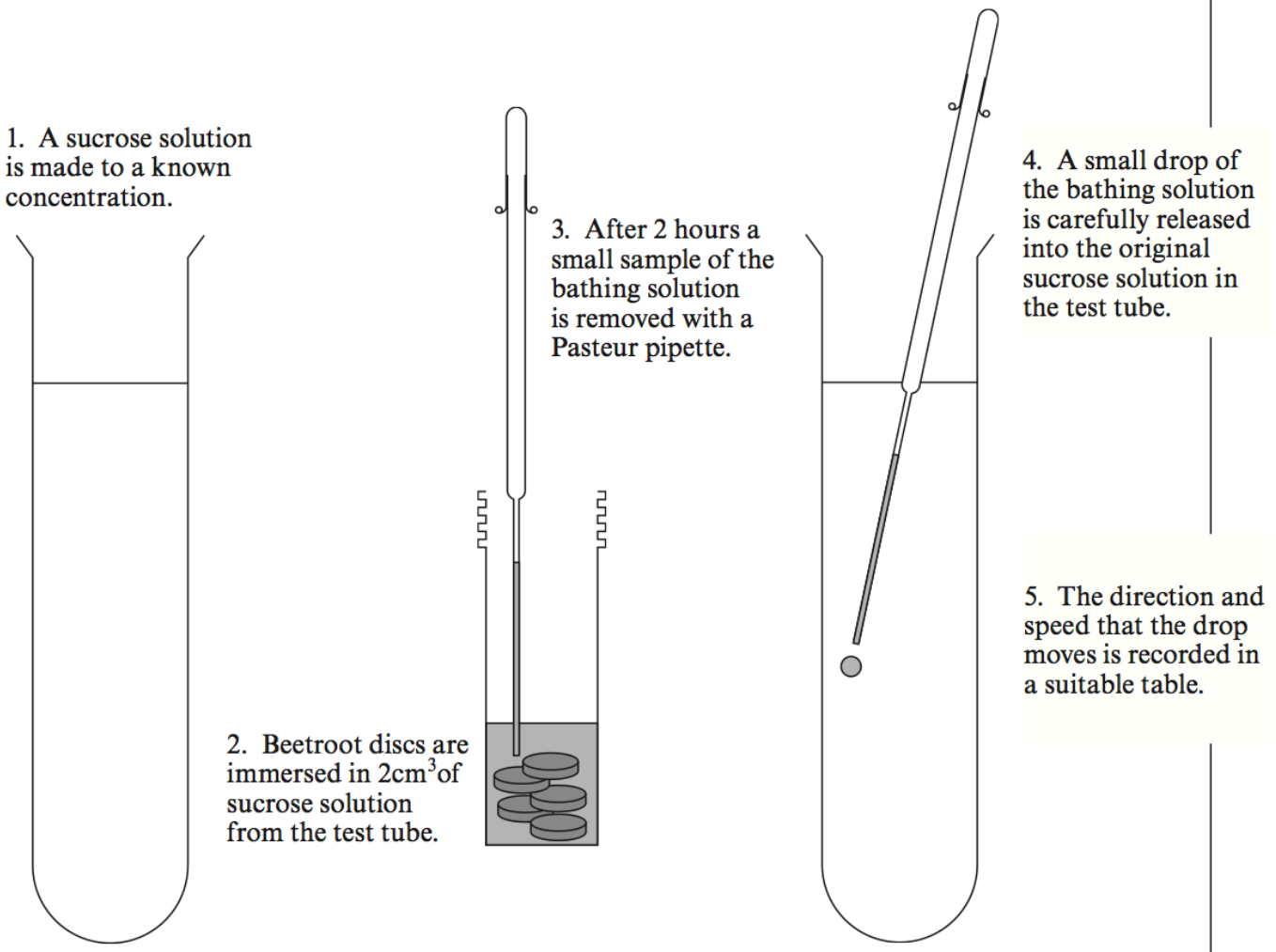
(Total 16 marks)

8.

6. The diagram below summarises a technique used to measure the water potential of beetroot cells.



(a) The table shows the results of an experiment carried out by some students.

Concentration of sucrose solution (M)	*Direction droplet moved (number of arrows indicates speed of movement)*
0.1	↓↓↓
0.2	↓↓
0.3	↓
0.4	↔
0.5	↑
0.6	↑↑
0.7	↑↑↑

(i) According to these results which concentration of sucrose has the same water potential as the beetroot cells? [1]

.....

(ii) Use the table below to find the water potential (Ψ_{cell}) of the beetroot cells.

Concentration of sucrose solution (M)	*Solute potential, Ψ_s (kPa)*
0.1	–269
0.2	–526
0.3	–790
0.4	–1052
0.5	–1322
0.6	–1596
0.7	–1882

water potential (Ψ_{cell}) of the beetroot cells = ... [1]

(b) Explain why the drop of bathing solution rose in the 0.6 M solution. [4]

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(c) The solute potential (Ψ_s) of the contents of the beetroot cells was known to be –1100kPa. Use the equation below to calculate the pressure potential (Ψ_p) of the beetroot cells when they were at equilibrium in the 0.3 M sucrose bathing solution. Show your workings. [2]

$$\Psi_{cell} = \Psi_s + \Psi_p$$

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(d) (i) In the space below, draw a **labelled** diagram of a single beetroot cell from the 0.7 M sucrose bathing solution, to show how it would have appeared under a light microscope. [3]

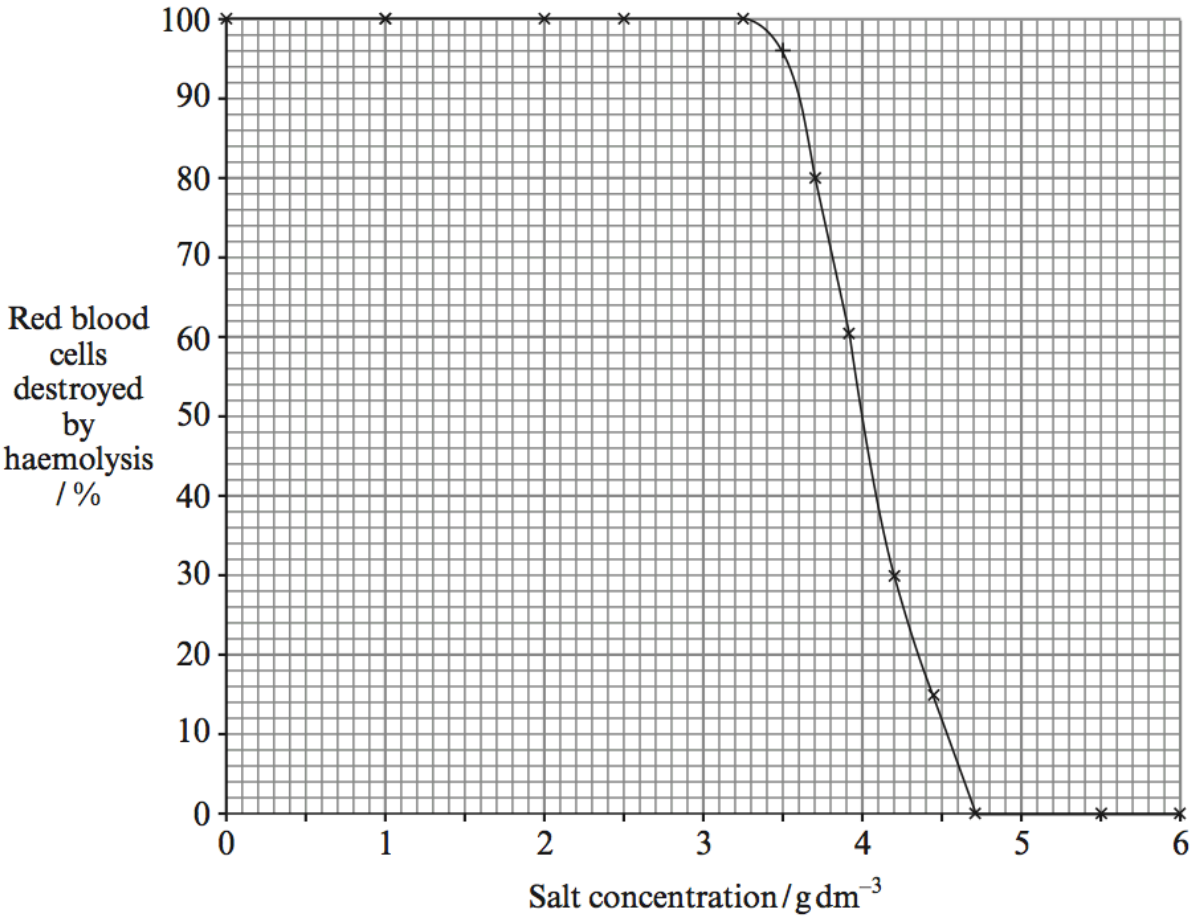
(ii) What term is used to describe cells in this condition? [1]

.....

(Total 12 marks)

9.

3. *(a)* An investigation was carried out in which red blood cells were placed in salt (sodium chloride) solutions of different concentrations. The percentage of cells destroyed by bursting (haemolysis) was recorded and the results shown in the graph below.



(i) Explain, in terms of water potential, why red blood cells burst when placed in a solution that has a lower concentration than plasma. [3]

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(ii) State the salt concentration at which the number of cells haemolysed is equal to that not haemolysed. [1]

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(iii) The graph shows that haemolysis occurs between $3.3 - 4.7$ g dm^{-3} salt concentration. Suggest why there is a range. [2]

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(b) An investigation was carried out on the uptake of potassium ions by root tissue.
The root was cut into four discs of uniform size and each disc was added to an equal volume of a solution containing a fixed potassium ion concentration.
The experiment was carried out in different oxygen concentrations and the results are shown in the table below.

Oxygen concentration / arbitrary units	0	4	11	20
Rate of potassium ion uptake / arbitrary units	7	27	92	100

(i) State, with a reason, **one** *other* variable that should be kept constant. [2]

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(ii) Using the information in the table, state with an explanation, the **main** method by which potassium ions are taken into the root. [3]

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(c) State the rate of uptake you would expect if a drop of cyanide solution had been added to **each** of the four solutions.
Explain your answer. [3]

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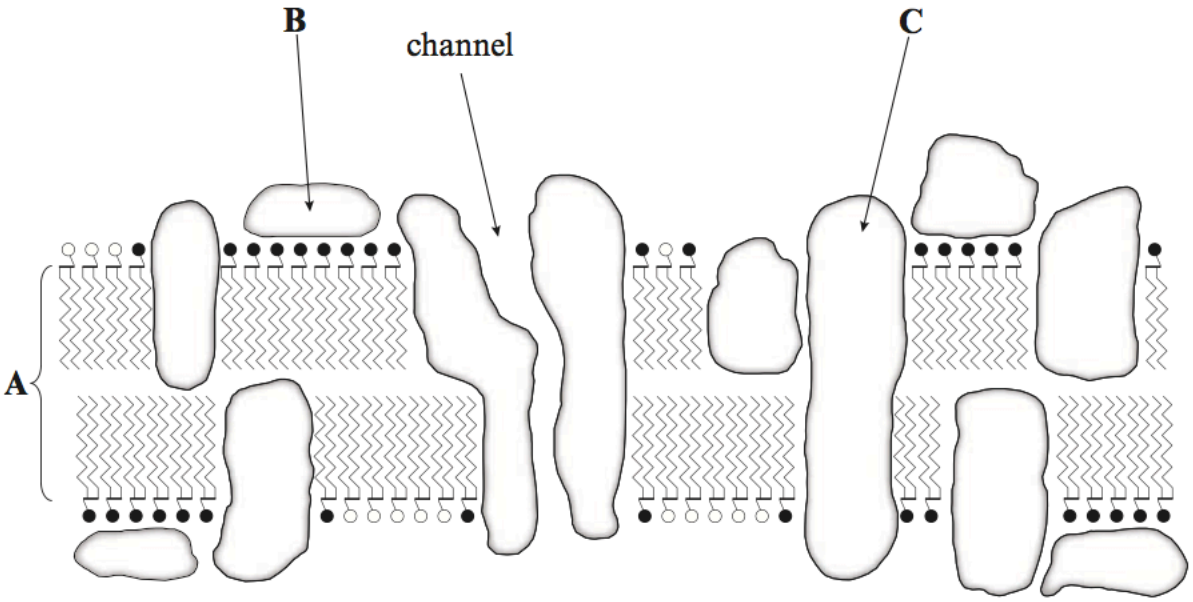
(Total 14 marks)

10.

(a) The diagram below is of a model of a section through a cell surface membrane, as proposed by Singer and Nicholson.



(i) State the name given to this model and give reasons why it is so-called. [3]

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(ii) Name the structures labelled **A**, **B** and **C**. [3]

A .....

B .....

C .....

(iii) Describe the function of the channel shown in the diagram. [1]

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(b) Some molecules are transported across the membrane by active transport. Explain what is meant by the term *active transport*. [2]

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(c) Suggest **two** reasons why transport across the membrane is vital to the cell. [2]

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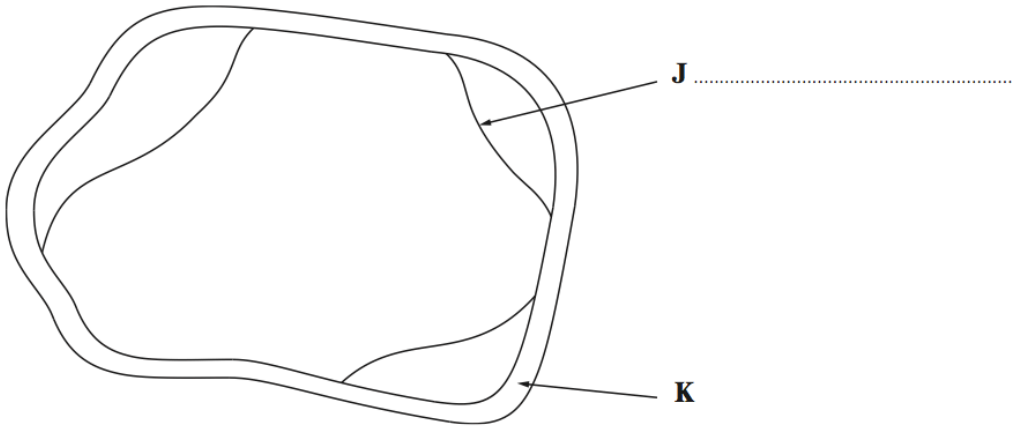
(Total 11 Marks)

11.

A student carried out an investigation on the solute potential of a plant tissue. The tissue was placed in a sucrose solution that had a water potential (Ψ) of –600 kPa and was left for one hour. The diagram below shows one cell after that time.
Approximately 50% of the cells showed signs of plasmolysis, the other 50% did not.



(a) Label structure **J** on the diagram. [1]

(b) The student concluded that the solute potential of the cell contents was –600 kPa. Explain why you think the student reached that conclusion. [3]

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(c) Explain the role of structure **K** in generating pressure potential in the cell. [3]

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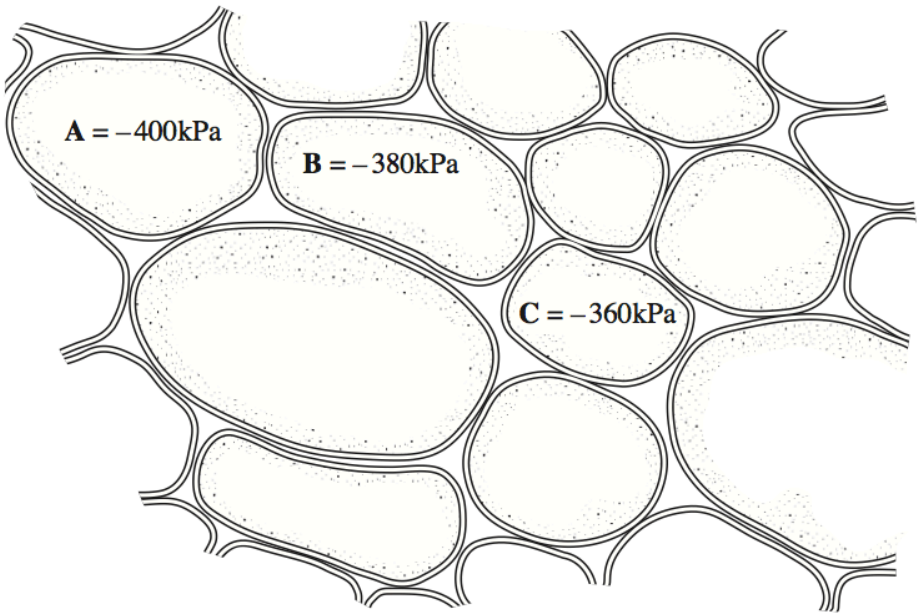
(Total 7 Marks)

12.

The diagram shows cells taken from the stem of a plant. Cells **A**, **B** and **C** are adjacent cells and the figures give the water potential Ψ of each cell.



(a) (i) Draw arrows on the diagram to show the overall direction of water movement between these **three** cells. [1]

(ii) Explain your answer in terms of water potential. [2]

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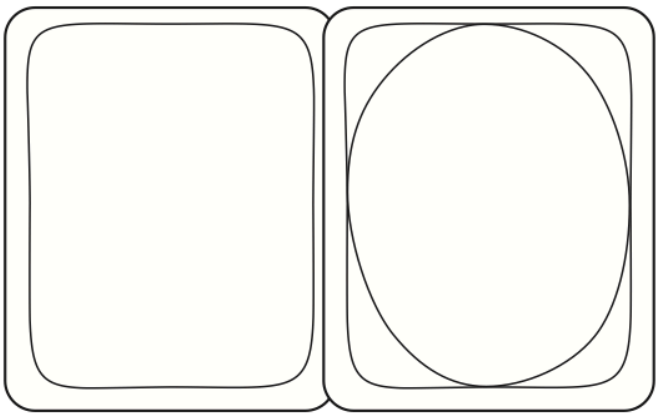
(b) The diagram below shows two plant cells, **X** and **Y** as seen through a microscope. The figures show the solute potential Ψs and the pressure potential Ψp for both cells and the water potential Ψ for cell Y.

Cell **X**

Ψp = 1000kPa

Ψs = –1800kPa



Cell **Y**

Ψp = 0kPa

Ψs = –1000kPa

Ψ = –1000kPa

Water relations in the cells are given by the following equation:

Ψ cell = Ψs + Ψp

'1-01)

(i) Calculate the water potential, Ψ, of cell **X**. Show your working. [2]

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(ii) State the name of the condition shown by cell **Y** and explain how this condition could have arisen. [3]

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(c) (i) Cell **X** has the higher pressure potential Ψp. Explain how this pressure potential is built up in cell **X**. [3]

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(ii) Suggest the effect on seedlings if all of their cells were in the condition as shown in cell **Y**. [1]

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(Total 12 marks)

13.

In an experiment 1 cm^3 of blood was added to 10 cm^3 of isotonic saline (salt) solution. To three separate test tubes, 1 cm^3 of the blood was added to equal volumes of each of the following: distilled water, ammonium chloride solution with a water potential of –476kPa and glycerol solution with a water potential of –896kPa. The time taken for the red blood cells to burst (haemolysis) is shown in the table.

Solution	*Time taken for haemolysis/s*	*Ψ/kPa*
Distilled water	10	0
Ammonium chloride solution	50	–476
Glycerol solution	720	–896

(a) (i) Suggest **one** problem in performing any investigation using blood. [1]

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(ii) Explain why haemolysis of the red blood cells occurred quickest when placed in distilled water. [3]

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(b) A sample of red blood cells were placed in a concentrated solution (Ψ – 2000 kPa) of sodium chloride.
Draw a diagram to show the expected appearance of one of the blood cells after five minutes and explain its appearance. [3]

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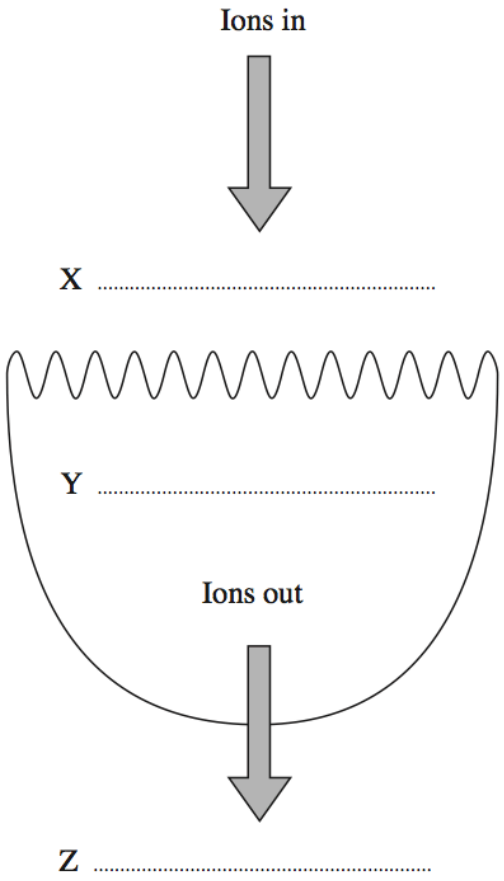
(Total 7 marks)

14.

(a) The diagram shows an animal cell.

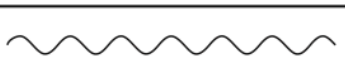
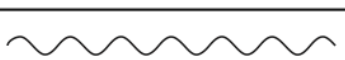


(i) Sodium ions diffuse into the cell. They then move out of the cell by active transport. Complete the diagram using the words HIGH or LOW to show the relative concentration of sodium ions at X, Y and Z. [1]

(ii) Explain how **one** structural feature of the cell shown helps to ensure a rapid rate of diffusion. [1]

.....

(b) (i) A number of factors influence the rate of diffusion.
In the table below circle the **letter** which shows the combination of factors which give the most rapid rate of diffusion. [1]

Appearance of membrane	*Concentration gradient*	*Thickness of membrane*	
	high to low	thick	A
	low to high	thin	B
	high to low	thin	C
	high to low	thick	D
	low to high	thin	E

(ii) Using the information in the diagram in part *(a)*, explain how active transport of sodium ions out of the cell helps to ensure a rapid rate of diffusion of sodium ions into the cell. [1]

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(iii) Describe and explain the effect of an increase in temperature on the rate of diffusion. [2]

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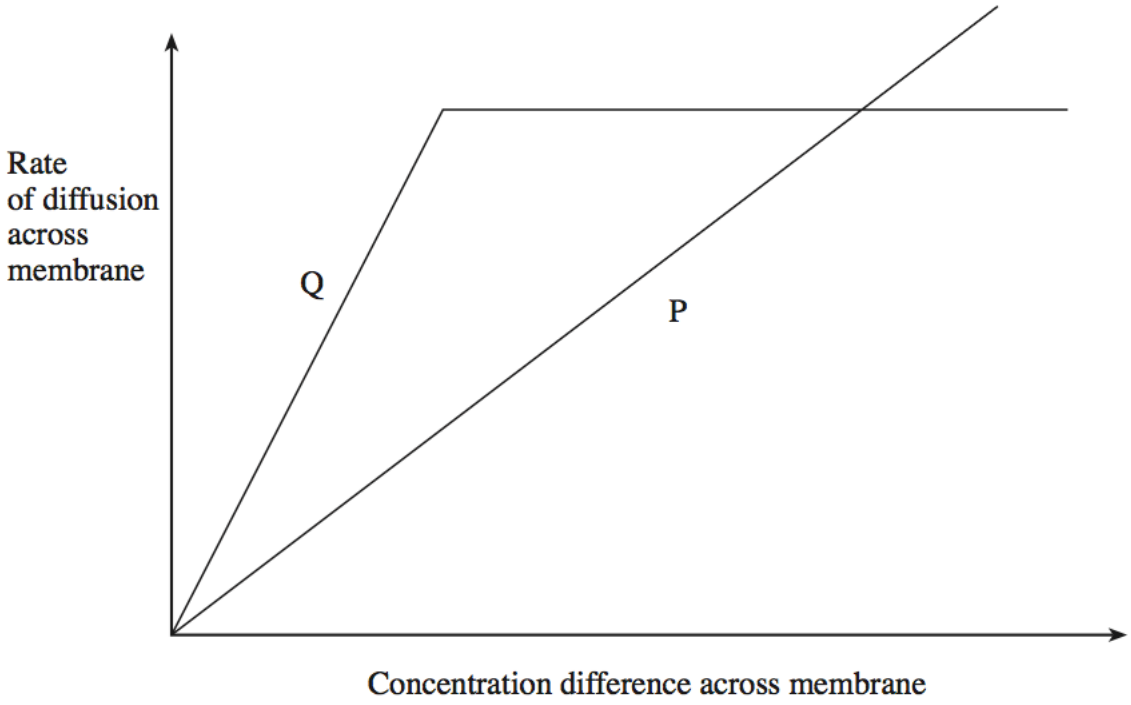
(c) The graph shows the relationship between concentration difference across a membrane and the rate of diffusion, for diffusion and facilitated diffusion.



(i) Identify the two lines.

P .....

Q .....

[1]

(ii) Using the graph and your knowledge of membrane structure explain the difference between P and Q. [2]

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(d) Define the term *water potential*. [1]

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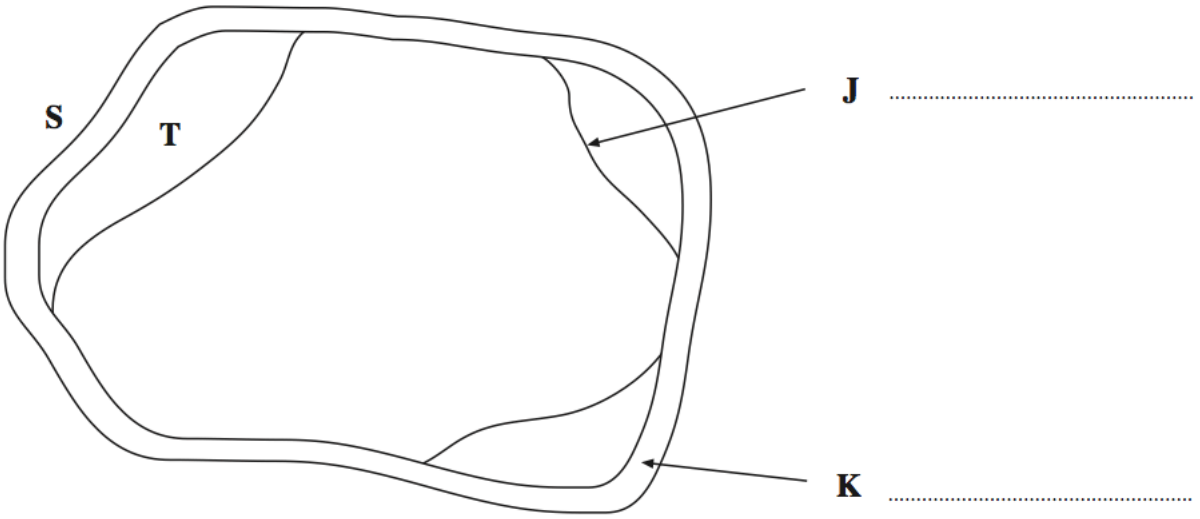
(e) A turgid plant cell was placed in a concentrated solution of sucrose. The diagram shows the appearance of the cell after one hour.



(i) Label structures **J** and **K** on the diagram. [2]

(ii) What evidence on the diagram shows that the water potential of the cell sap must be higher (less negative) than that of the sucrose solution? [1]

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(iii) Use your knowledge of a property of structure **K** to explain why the water potential at **T** must be equal to that at **S**. [2]

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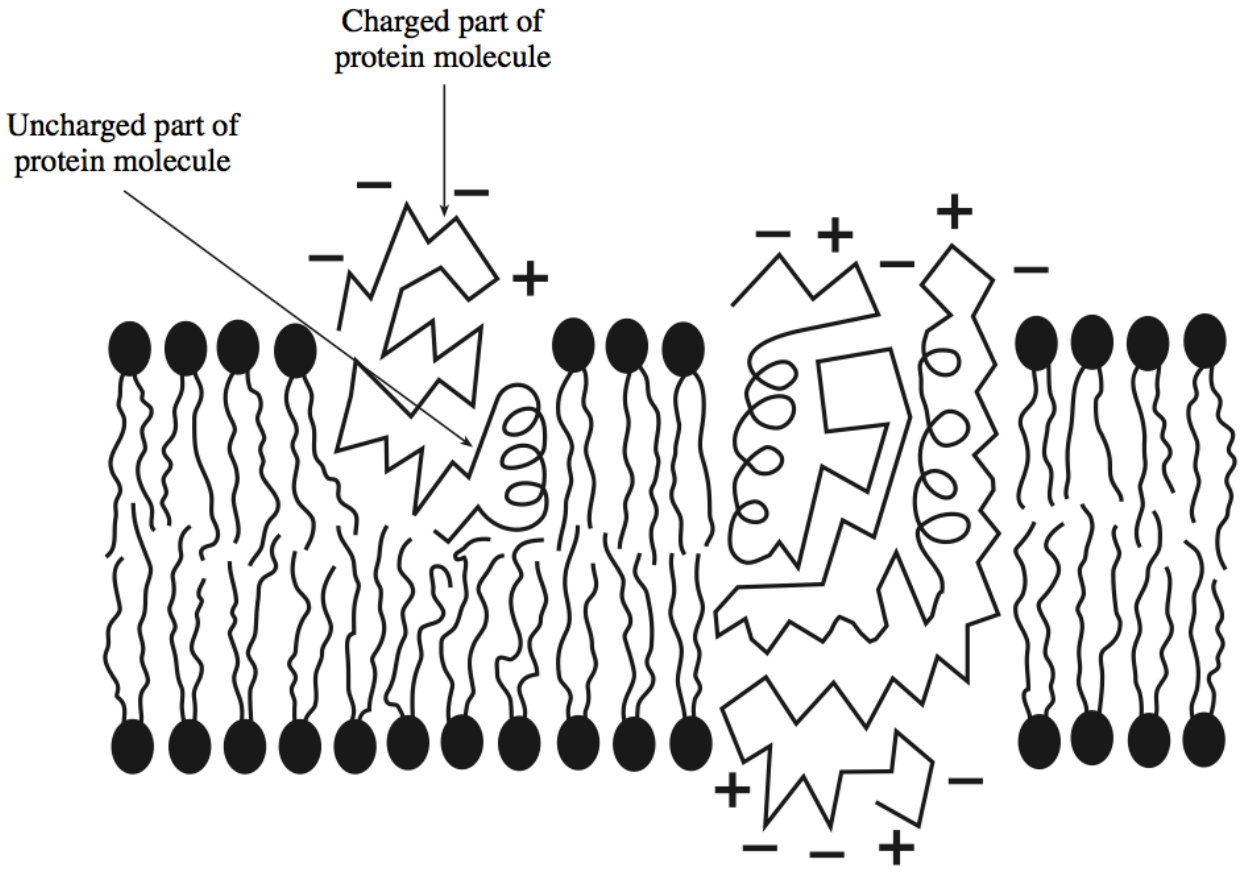
(Total 15 marks)

15.

4. The diagram represents a model of a biological membrane. This model has been described as 'a phospholipid sea with protein icebergs'.



(a) (i) Name the model, proposed by Singer and Nicholson in 1972. [1]

.....

(ii) Select a single phospholipid molecule in the diagram and label the part which is hydrophilic and the part which is hydrophobic. [1]

(b) The proteins are drawn to give some indication of their tertiary structure.

Explain the difference between secondary and tertiary structure of protein molecules including reference to the type of bonds involved. [4]

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(c) (i) With reference to the diagram and your answer to part *(a)* (ii), explain how the distribution of charged and uncharged parts determine the position a protein will take up in a membrane. [2]

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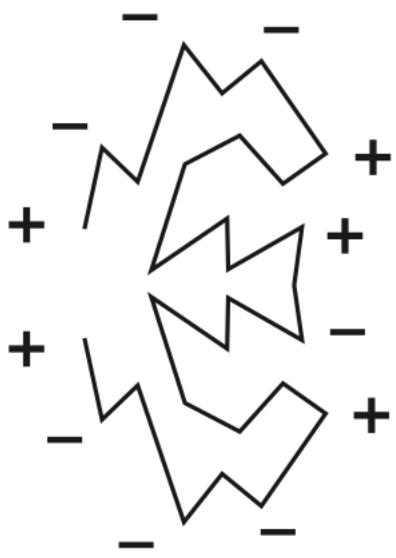
(ii) The diagram below shows another protein.



Suggest how this protein would position itself in the membrane. [1]

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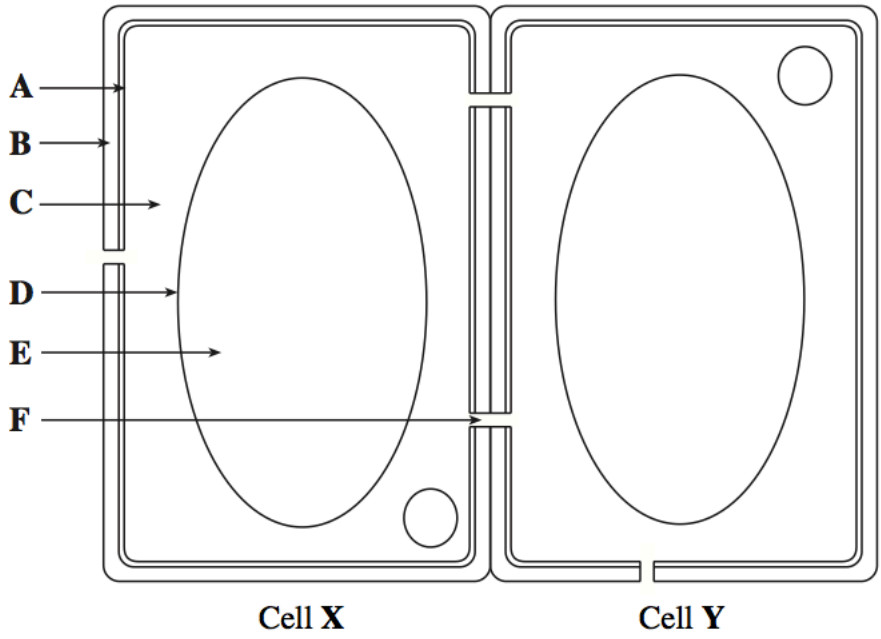
(Total 9 marks)

16.

The drawings below show two adjacent plant cells, placed in a 0.6 Molar glucose solution.



(a) Name the parts labelled **A-F**. [2]

A .....

B .....

C .....

D .....

E .....

F .....

(b) Name **two** ways by which materials move between cell **X** and cell **Y**. [2]

.....

.....

(c) Cells **X** and **Y** are at incipient plasmolysis, in a 0.6 molar glucose solution.
Describe **one** change, that would be visible under the microscope, if the cells were placed in a 1 Molar glucose solution. [1]

.....

.....

(d) The water potential of vacuolated cells is represented by the equation:

$$\Psi_{cell} = \Psi_s + \Psi_p$$

(i) Define the term *water potential*. [1]

.....

.....

.....

(ii) Give the value of Ψ_p in cells at incipient plasmolysis. [1]

.....

(iii) Two different cells **P** and **Q** are adjacent to one another in a plant. Calculate the missing values for each cell and complete the following table. [2]

Cell	Ψ_{cell} *kPa*	Ψ_s *kPa*	Ψ_p *kPa*
P	.....	–1200	+500
Q	–300	.....	+300

(iv) In which direction will water move between these two cells? [1]

.....

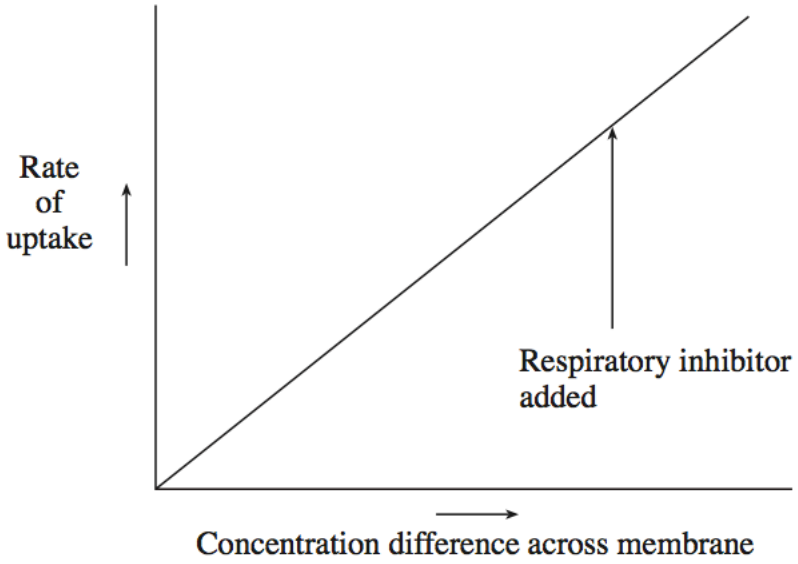
(Total 10 marks)

17.

The following graphs show the effect of an increasing concentration gradient on the rate of uptake of substances across a cell membrane. The effect of adding a respiratory inhibitor on the rate of uptake is also shown.

For **each** graph name the type of uptake involved and give reasons for your choice.

(i) Process A



Type of uptake ..... [3]

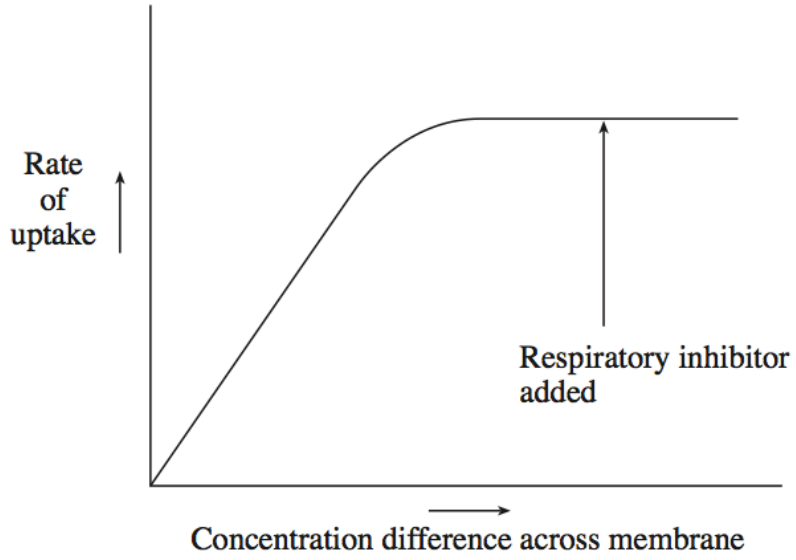
Reasons for choice .....

.....

.....

.....

(ii) Process B



Type of uptake ..... [3]

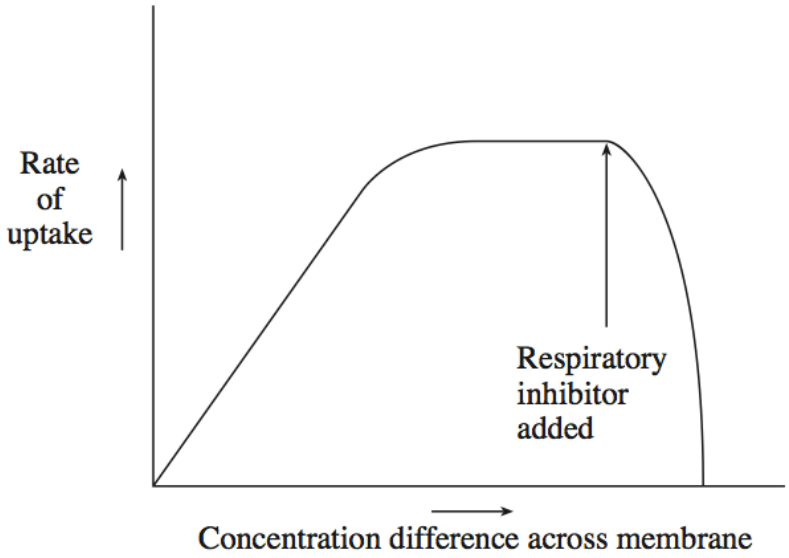
Reasons for choice .....

.....

.....

.....

(iii) Process C



Type of uptake ..... [3]

Reasons for choice .....

.....

.....

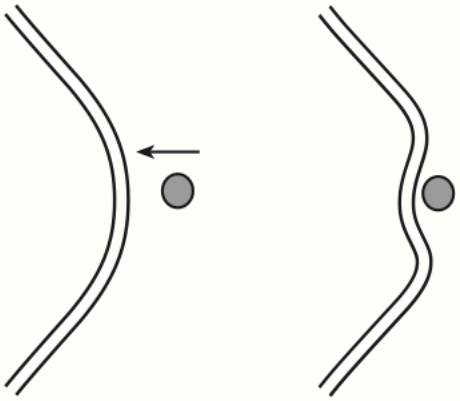
.....

(Total 9 marks)

18.

(a) Diagrams **I** and **II** below show the beginning of the process by which a particle is taken into a cell. In the spaces provided, draw and **label** two diagrams (**III** and **IV**) to show the completion of the process. [3]

I **II** **III** **IV**



(b) What effect does this process have on the surface area of the cell membrane? [1]

.....

(c) Name:

(i) the process, [1]

.....

(ii) the movement of materials in the reverse direction across the membrane. [1]

.....

(Total 6 marks)

19.

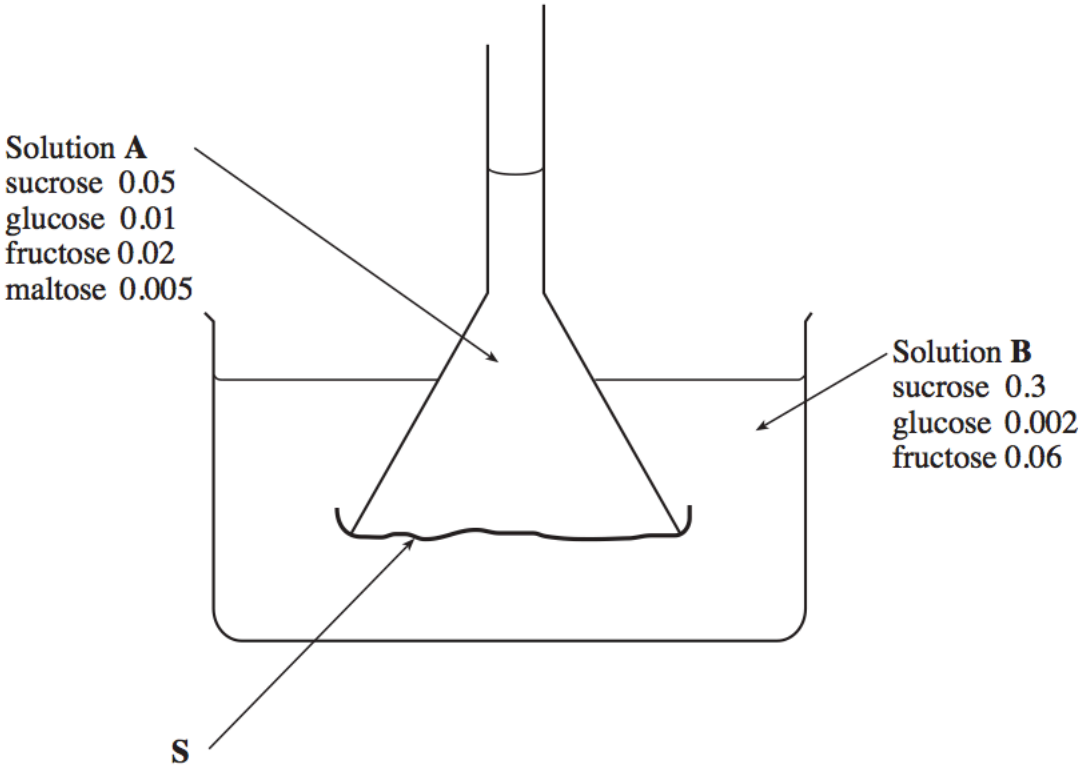
Each statement in the table below applies to **one or more** of the three ways in which materials in solution can enter a cell across the plasma membrane.
Complete the table by ticking the appropriate boxes.

	Diffusion	*Facilitated Diffusion*	*Active Transport*
Substance dissolves in lipid part of membrane.			
Will not take place in presence of cyanide.			
Movement involves membrane proteins.			
Does not require cell energy.			
Rate is proportional to concentration gradient across membrane.			
Due to random movement of molecules in external solution.			
At very high external concentrations the rate of movement is constant.			
Membrane proteins act as pumps.			

(Total 11 marks)

20.

The diagram shows an inverted funnel which contains a mixture of sugars in solution **(A)** and is clamped in a beaker containing another sugar solution **(B)**. The concentrations of sugars in mol dm^{-3} are shown in the diagram.



The funnel opening is covered by a selectively (partially) permeable membrane **(S)**.
The membrane is permeable to monosaccharides and water, but not to disaccharides.

(a) (i) Which of the solutions would have the higher (less negative) water potential? [1]

.....

(ii) Explain your choice. [1]

.....

.....

(b) After a time interval, would the level of liquid in the stem of the funnel have

risen,

stayed in the same place,

or fallen?

Underline your choice and explain your reason. [2]

.....

.....

(c) Name a solute which would [2]

(i) diffuse into solution **A**,

.....

(ii) diffuse out of solution **A**.

.....

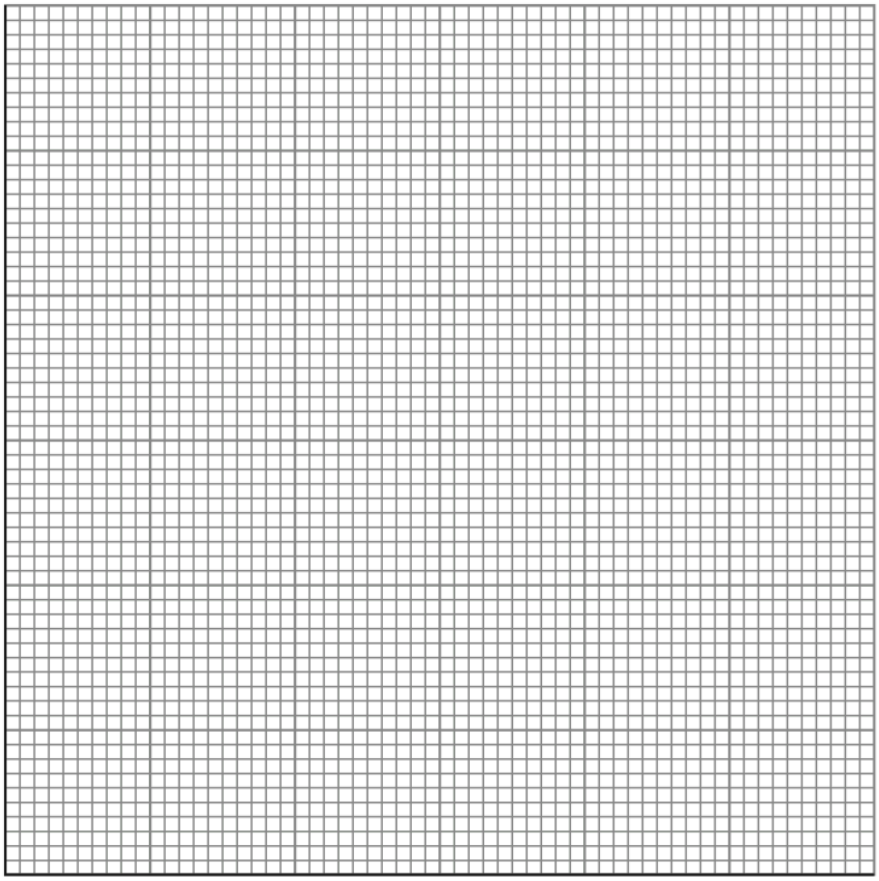
(Total 6 marks)

21.

Strips of onion epidermis of approximately equal dimensions were placed into sucrose solutions of different concentrations. After 20 minutes the strips of epidermis were removed and the change in mass of the strips from the start of the experiment was determined. The results are shown in the table below.

Concentration of sucrose / M	*Change in mass / %*
0.15	+4
0.20	+3
0.25	+2
0.35	−2
0.40	−4
0.50	−22
0.55	−37

(a) (i) Plot a graph showing the variation in mass change with the concentration of sucrose. [4]



(ii) Use your graph to determine the concentration of sucrose at which there is no change in mass. Write the value on the line below. [1]

.....

(iii) Explain, in terms of water potential why there is no change at this point. [3]

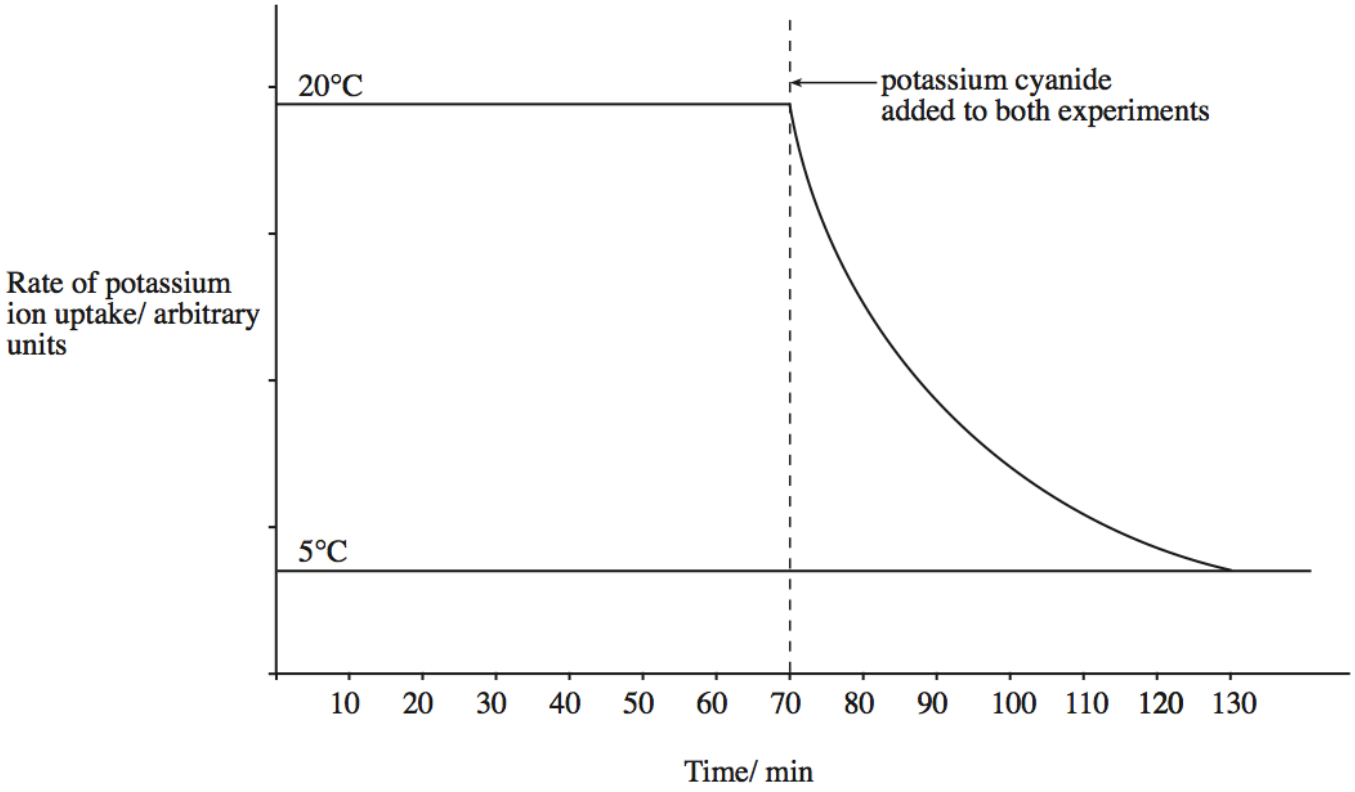
.....

.....

.....

.....

(b) The graph below shows the absorption of potassium ions by young cereal plant root hairs which were kept in aerated solutions maintained at two different temperatures. After 70 minutes potassium cyanide was added to the solutions at each temperature.



(i) How does the information given show that the root hairs take up the ions by **active transport**? [3]

.....

.....

.....

.....

(ii) Explain, why at low temperatures potassium uptake continues after the addition of potassium cyanide. [1]

.....

.....

(Total 12 marks)

22.

Beetroot cells contain a red pigment.
Cut cubes of beetroot were washed to remove the red pigment from damaged surface cells.
The cubes were placed in test tubes containing $10cm^3$ water, in waterbaths at a range of temperatures.
The tubes were left at each temperature for 10 minutes.
The beetroot was removed from the tubes and the colour of the solution in the tube measured on a colorimeter.
The darker the red colour of the solution, the greater the colorimeter reading.
The following results were obtained.

	Temperature (°C)						
	10	*20*	*30*	*40*	*50*	*60*	*70*
Colorimeter Reading (Arbitrary units)	0	1	4	7	80	90	100

(i) Describe the pattern of results from the above table. [2]

.....

.....

.....

(ii) Explain the results as fully as you can. Refer to cell membrane structure in your answer. [3]

.....

.....

.....

.....

(iii) Explain the difference in the results if you were investigating the effect of ethanol on the permeability of the membrane. [1]

.....

(Total 6 marks)

23.

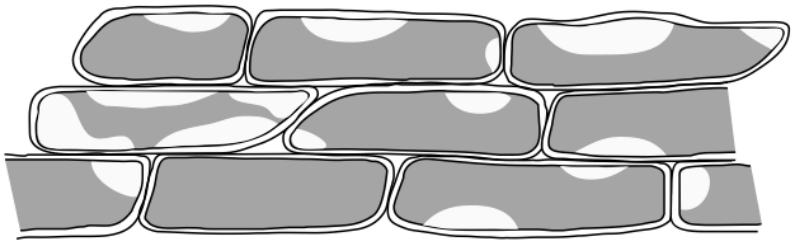
Different compounds are transported through the plasma membrane into the cell in different ways. Complete the table below to show how the three types of compound in the first column enter the cell. In the last column list one factor which could alter the rate of entry of the compound at constant temperature.

Type of compound	*Mode of transport into cell*	*Component of the membrane through which it passes*	*Factor affecting rate of transport*
Lipid soluble			
Water soluble in high external concentration			
Water soluble in very low external concentration			

(Total 9 marks)

24.

The diagram below shows some plant cells as seen through a microscope.



Water relationships in the cell are related by the following equation

$$\Psi \text{ cell} = \Psi s + \Psi p$$

where Ψs is the solute potential and Ψp is the pressure potential.

(a) On the diagram label:

A – a plasmolysed cell;

B – a turgid cell. [2]

(b) (i) What proportion of the cells would be plasmolysed when their mean Ψs equals the water potential of the external solution? [1]

.....

(ii) What is the name given to this situation? [1]

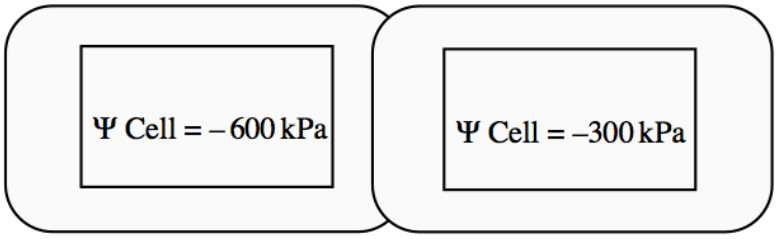
.....

(c) A plant cell has a water potential of -600 kPa and a solute potential of -950 kPa. Calculate the pressure potential of this cell. [1]

.....

.....

(d) (i) Draw an arrow to show the overall direction of water movement between the two cells below. [1]



(ii) Calculate the water potential of the two cells at equilibrium. [1]

.....

(Total 7 marks)

25.

(a) In the space below draw a diagram to show the structure of the cell membrane as proposed by Singer and Nicolson in their *fluid mosaic* model. Label your diagram. [6]

(b) Explain why the words *fluid* and *mosaic* are used to describe the structure of the membrane. [2]

Fluid .....

.....

Mosaic .....

.....

(c) Cells can be 'stained' using chemicals dissolved in water. When sections of the cell membrane from such 'stained' cells are observed using the electron microscope, the membrane has a three layered appearance as shown below.

Suggest why the membrane has this appearance. [1]

.....

.....

(d) Give the names of **three** structures surrounded by a <u>double membrane</u> which are found within cells. [2]

1 .....

2 .....

3 .....

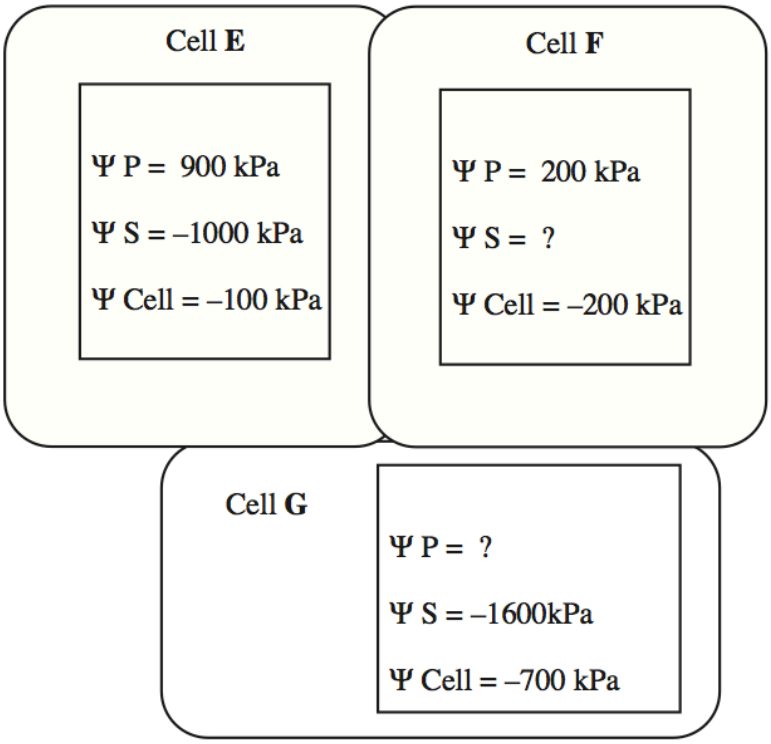
(Total 11 marks)

26.

(a) What is the water potential of pure water? [1]

..... kPa

(b) The diagrams below show the water potentials of 3 cells, which are in contact with each other.



Using the equation

$$\Psi \text{ Cell} = \Psi \text{ P} + \Psi \text{ S}$$

answer the following questions. [2]

(i) Calculate the solute potential of cell **F** ..... kPa

(ii) Calculate the pressure potential of cell **G** ..... kPa

(c) (i) Which cell will gain the most water from the other cells? [1]

.....

(ii) Which cell will lose most water? [1]

.....

(d) What word is used to describe the process by which a cell loses water until its plasma membrane draws away from its cell wall? [1]

.....

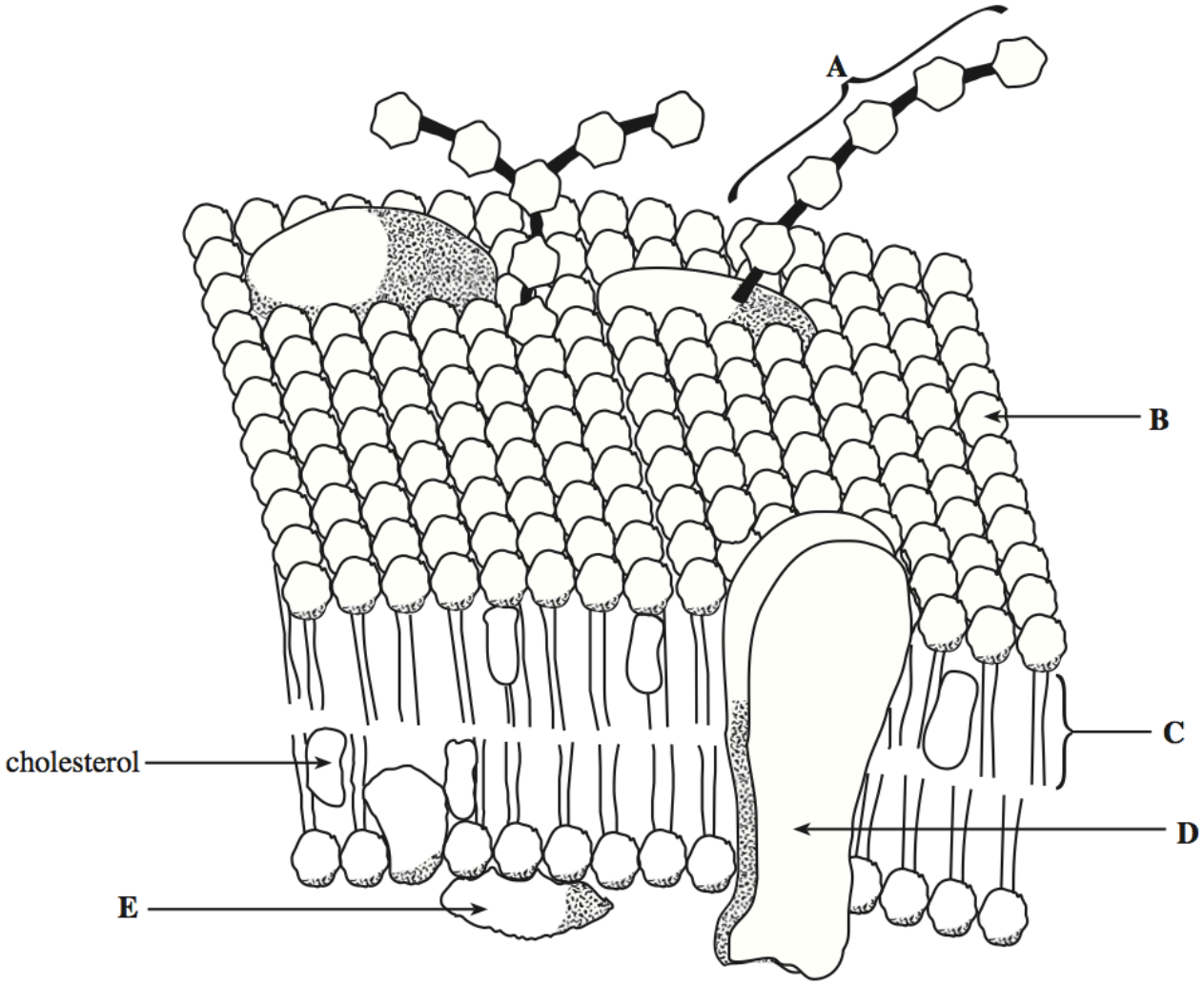
(e) What would happen to an **animal** cell placed in an hypotonic solution? [1]

.....

(Total 7 marks)

27.

6. The diagram shows the plasma membrane of an animal cell.



With reference to the diagram.

(a) (i) State the names of the structures labelled **A** to **E**. [5]

A .....

B .....

C .....

D .....

E .....

(ii) State the name given to this model of membrane structure. [1]

.....

(b) Glucose and vitamin A are molecules that enter a cell by passing across the membrane. Glucose is water soluble and vitamin A is fat soluble.

Explain how the properties of the molecules and the structure of the membrane determines the way in which these two substances pass across.

Glucose [2]

.....

.....

.....

Vitamin A [2]

.....

.....

.....

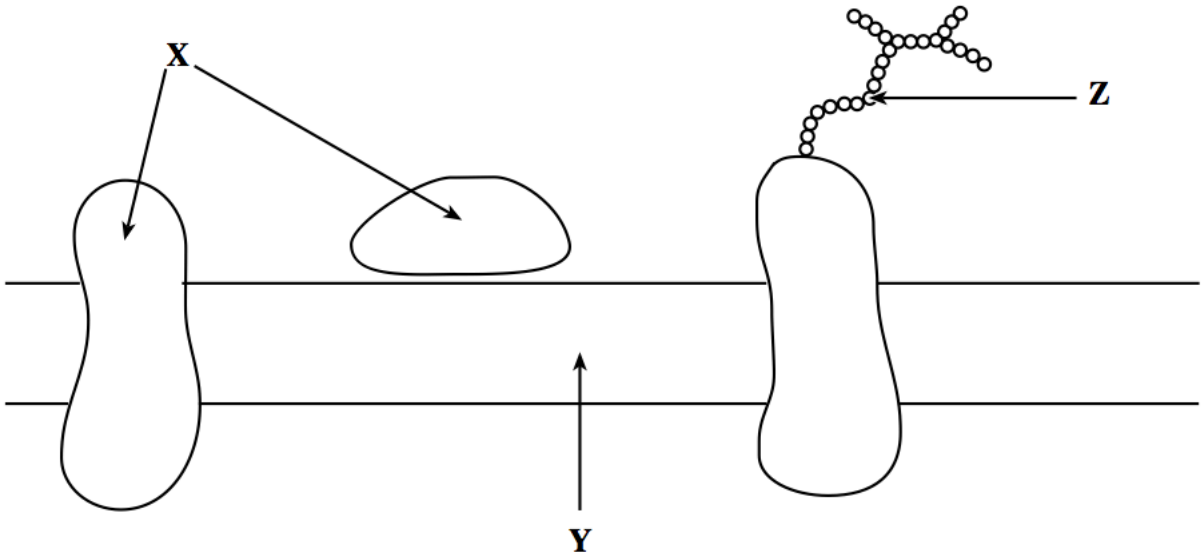
(c) Name **two other** methods by which substances cross the plasma membrane. [2]

.....

(Total 12 Marks)

28.

The most widely accepted model of the structure of biological membranes is known as the fluid-mosaic model.



(a) Name the class of biologically important chemicals from which each of the parts labelled **X**, **Y** and **Z** are made. [3]

X .....

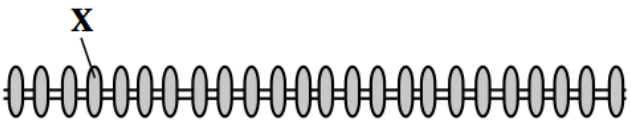
Y .....

Z .....

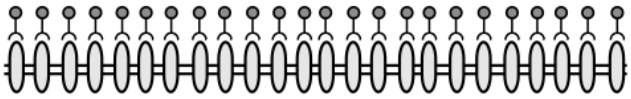
(b) Make a labelled diagram to show the arrangement of molecules in part **Y**. [3]

(c) The model is described as fluid because the component molecules are free to move about. Evidence for this includes experiments like the one shown below, in which component molecules **X** are labelled with a dye.

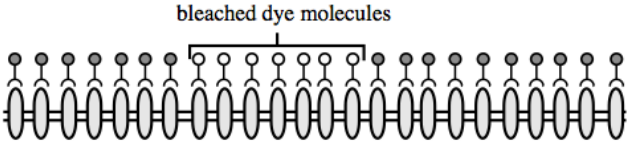
A - the membrane model



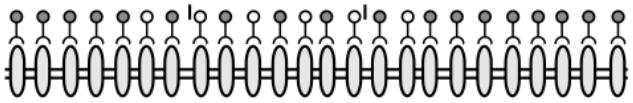
A molecule of dye was attached to each molecule X



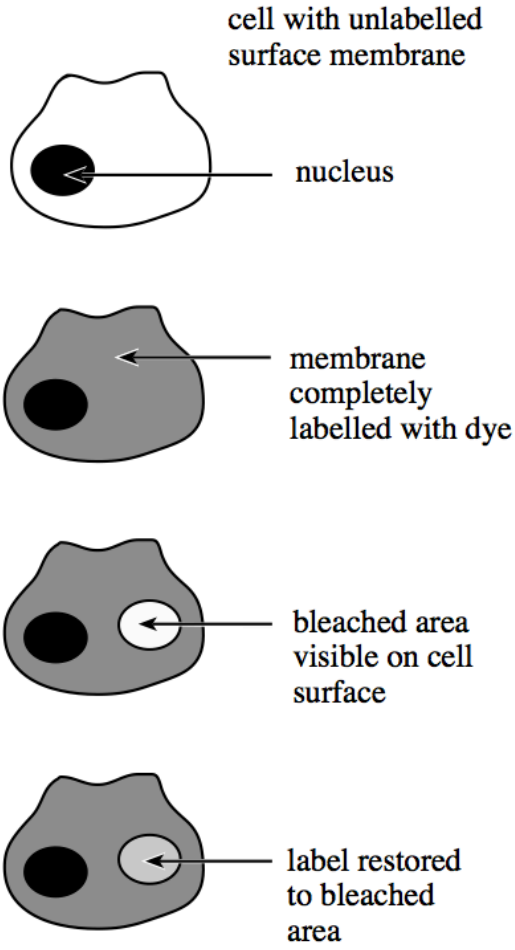
A patch of dye was bleached with a laser beam.



After a short time the patch became coloured again



B - appearance of cell



Using the information above, suggest how the colour was restored to the bleached area. [2]

.....

.....

.....

.....

.....

.....

(d) Give **three** functions of the cell surface membrane. [3]

.....

.....

.....

.....

.....

.....

(Total 11 marks)

29.

An experiment was carried out in which strips of red onion epidermal cells were immersed in a series of sucrose solutions. The results are shown in the table below.

Molarity of sucrose solution (M)	*% plasmolysed cells*
0.00	0
0.20	2
0.40	13
0.45	25
0.50	75
0.55	88
0.60	95
0.80	100

(a) (i) Draw a graph on the opposite page using the data above. [4]

(ii) Using the graph, what is the solute potential (Ψ_s) value in sucrose molarity for the red onion cells? ..... [1]

(iii) Explain how you have arrived at this answer. [1]

.....

.....

(b) Draw and label a plasmolysed red onion cell as you would see it under the microscope. [3]

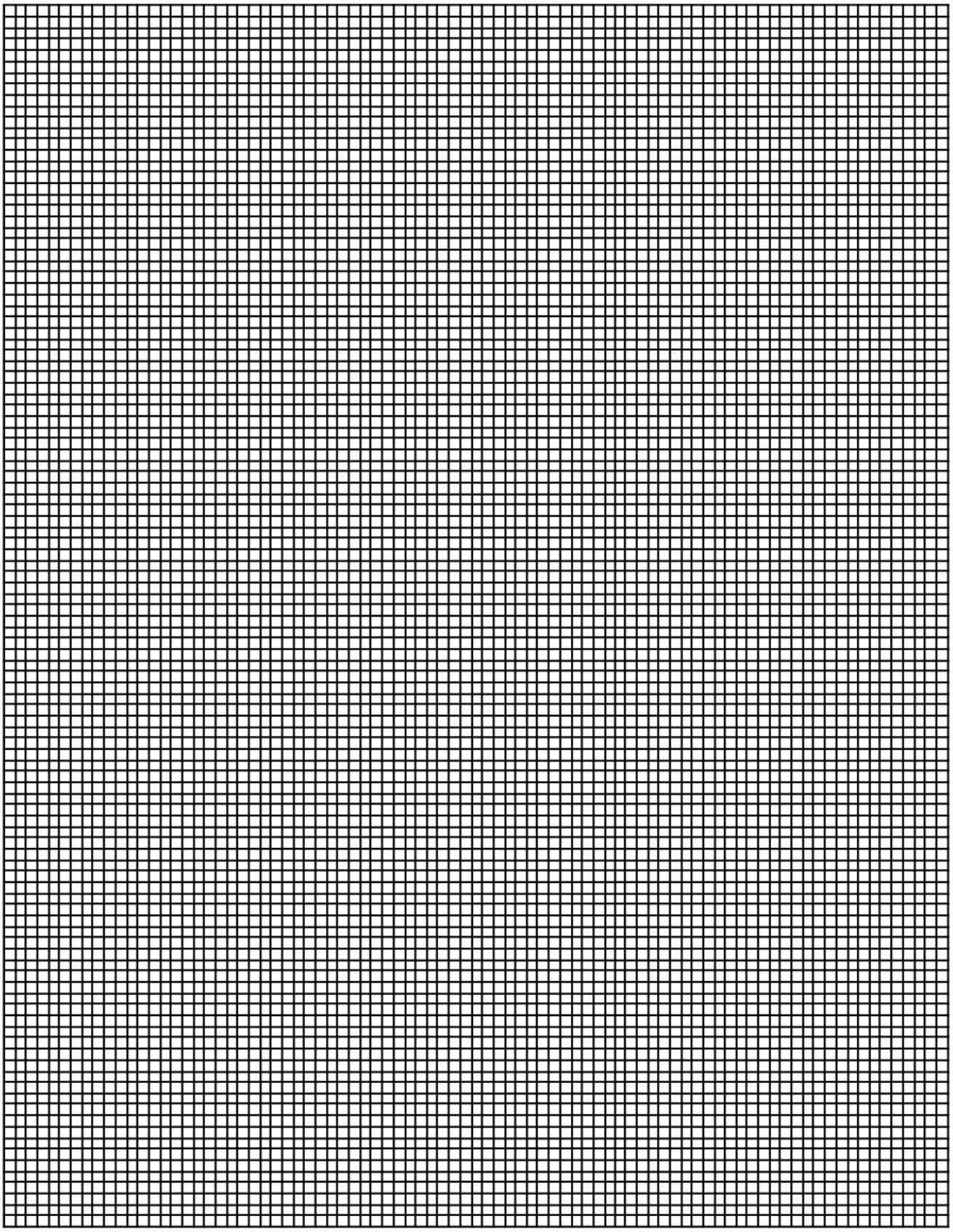
(c) How could the cells which were in 0.8 M sucrose be returned to a turgid condition? Explain your answer. [2]

.....

.....

.....

(Total 11 marks)



30.

Answer the following questions in the spaces provided.

(a) Define the term *osmosis*. [2]

.....

.....

.....

.....

(b) What word describes a plant cell which has gained a maximum amount of water? [1]

.....

(c) What word is used to describe a cell where the cytoplasm has pulled away from the cell wall? [1]

.....

(d) In what way is active transport different from osmosis? [1]

.....

.....

(e) What is the effect of cyanide on active transport? [1]

.....

.....

(Total 6 marks)

Essays

1.

(b) Globular proteins are an important component of plasma membranes. Describe the structure and function of membrane proteins. [10]

2.

(b) Describe and explain the effects of placing animal and plant cells in solutions of differing solute concentration. [10]

3.

(a) The cell (plasma) membrane consists of a number of parts.
Describe the structure of the cell membrane and the functions of these parts. [10]

4.

(a) Describe the structure of the plasma membrane. [4]
Describe the various ways in which small molecules enter the cell. [6]

5.

(b) Describe the methods of transportation across a cell membrane. [10]

6.

(a) Describe, giving examples, how materials get into and get out of cells. [10]

7.

(b) Describe the various ways in which materials can enter a cell across the plasma membrane. [11]

8.

(a) Give an **illustrated** account of the detailed structure and functions of the plasma membrane. [10]